

## Chapter 4

### Planning for Emergencies

Public water systems play a critical role in all Indiana communities. Not only do these systems provide safe and dependable supplies of drinking water, but they also provide water for fighting fires resulting from natural and manmade causes. When an emergency affects a public water-supply system, an entire community can be without water or fire protection. Both the Federal Safe Drinking Water Act and the Indiana Administrative Code require public water-supply systems to be prepared for events that may threaten the continued provision of water service.



Whether it is installing an emergency generator or developing a readily available list of emergency contacts, plans for dealing with emergency situations must consider all of the potential risks faced by the public water-supply system. This chapter aims to provide guidance for water systems as they prepare for events that will hopefully never occur, but which can cause significant impacts if and when they do happen.

Listed below we have tried to identify the types of emergencies a water system can experience, both natural and human induced. Also, we have listed for your review the effects such emergencies might have on a water system and we have listed many general items to include in your emergency planning efforts. Some specific and more detailed plans and preparations your water system may consider in an effort to manage the aftermath of an emergency are also listed.

The greatest effort that can be made in handling of emergencies is in the production of a plan before an emergency occurs. Attempting to put together a plan of attack during a disaster is a disaster in itself. Preparedness is the key to surviving any emergency.

## 4.1 Types of Emergencies a water system may encounter

Any public water system could become a victim of various kinds of emergencies. There are two basic types of emergencies affecting a water system, natural and human induced.

The first step in developing an emergency plan is to determine which type of emergency your water system is likely to experience. Many potential emergencies can be averted or minimized by such advance preparation. Listed below are the types of emergencies a water system may encounter.

### 4.1.1 Natural Disasters

Blizzard	Deep Freeze	Earthquake	Major Water Main Break
Ice Storm	Drought	Flood	Tornado

### 4.1.2 Human-Induced Disasters

Back Flow into System	Explosion	Riot	Terrorism
Chemical Shortage	Loss of Operator	Sabotage	Vandalism
Chemical Spill	Power Outage	Strike	

## 4.2 Effects of natural disasters on a water system

### 4.2.1 Floods

Flooding can cause tremendous damage to public work facilities including bridges, roads and water treatment plants. Often located near the river, a water plant is susceptible to flooding. Problems encountered can include:

- High turbidity in raw water
- Plugging of raw water intake
- Loss of impounded reservoir
- Loss of low head dam
- Failure of river crossing pipelines
- Contamination of clear wells
- Difficulty accessing the facility by employees
- Water services at flooded houses becoming contaminated
- Water damage to plant or other facilities
- Great damage to other utilities serving the water plant such as gas, electric and telephone

### 4.2.2 Earthquake

Although not as common in Indiana as in the western states, there is the possibility of an earthquake occurring. Ohio and Kentucky are adjacent states that have experienced the damage caused by earthquakes. A water system can be damaged in the following ways by an earthquake:

- Damage to water plant structures, walls, roofs, piping
- Damage and disruption to distribution system lines
- Damage to storage tank foundations and connecting piping
- Bridges used to access water plants damaged or destroyed
- Water services broken with a large water loss to follow
- Damage to impounding reservoir walls
- Great damage to other utilities serving the water plant such as gas, electric and telephone

### 4.2.3 Tornado

Tornadoes are not unusual in Indiana. The possibility or threat of a water treatment plant receiving damage or affected in some way by high winds or an actual tornado is real. Water systems that have experienced damage from a tornado have recorded the following problems:

- Power disruptions or loss of service
- Structural damage, roof, walls, windows, doors
- River intake filled with debris
- Water services pulled out of ground as buildings are destroyed
- Hydrants knocked off from flying debris
- Large loss of water in system
- Difficulty gaining access to the plant or distribution valves by employees
- Loss of elevated water storage tank

### 4.2.4 Blizzard/Snow Storms

Severe snowstorms and official blizzards can cause havoc with a water system. Listed below are some of the damages caused by such winter weather.

- Difficulty for employees to get to work
- Traffic accidents damaging hydrants
- Loss of hydrants located in snowdrifts
- Roofs collapsing
- City paralyzed, difficult to check tanks and wells

### 4.2.5 Ice Storm

Unlike a blizzard there could be little snow to handle and snowplows become ineffective. However, the effects on the water plant can be devastating.

- Icy road conditions can result in hydrants damaged by motor vehicles
- Again, access to the plant can be difficult
- Ice on raw water intake
- Power lines down; loss of energy

#### 4.2.6 Deep Freeze

In 1977 much of Ohio, Michigan and Indiana suffered from what was later termed the Deep Freeze; extended periods of sub zero temperature coupled with little or no snow cover on the ground. Water crews worked around the clock for days in an effort to provide continued water service. Water systems experienced the following:

- Increased number of main breaks
- Frozen services
- Frozen mains
- Frozen hydrants
- Ice on treatment tanks
- Frozen water storage tanks
- Freeze-up of operating equipment
- Ice at water intakes

#### 4.2.7 Drought

Both surface and ground water supplies can be affected by a drought. Lack of snowfall for several winters combined with a dry summer can result in low reservoir and lake levels, lower than normal stream flows and lowered well levels. The following problems will face the water plant operator experiencing drought conditions:

- Diminished raw water supply
- Poorer quality raw water
- Taste and odor problems
- Reduced fire protection
- Sprinkling bans
- Conservation and rationing
- An increased demand for water by consumers

#### 4.2.8 Major Water Main Break

Although many may argue that a main break cannot be considered a natural emergency, and rightly so if a contractor has just excavated your 12" tee from the water line. However, quite often we could agree that main breaks are caused by extreme changes in temperature, earth movement and stress on the piping system. A major break is one in a large diameter pipe, usually longitudinal rather than circumferential (ring around) which will cause a great volume of water to be lost and result in many other problems for the water system operator.

- Depressurization of system ("0" pressure)
- No fire protection
- Damage to pavement or property
- Traffic disruption
- Difficulty in starting up the system again; cloudy water, etc.
- Boil water orders

#### 4.3 Human Induced Disasters

##### 4.3.1 Strike

Although most smaller water systems in Indiana are not involved with labor contracts and obligated to follow union contracts, some are unionized and can be affected by a strike if such an impasse ever arises. The loss of a labor force can obviously cause problems for a water system and if a small system with only a few workers the problem is further complicated.

During a strike the water system can experience a lack of personnel to accomplish much of the work and possibly blockage of the access to the treatment facilities. Hopefully a work stoppage will be short termed and cool heads will prevail on both sides. However, management should develop a strike plan, which would be made available to the remaining non-represented supervisory people who are charged with keeping the water system running.

#### 4.3.2 Vandalism

Vandalism occurring in the water system is not unusual. Most systems have experienced some type of deliberate damage to the facilities in the past. The following types of vandalism can occur which causes problems for a water system:

- Debris thrown into water supply or treatment tanks
- Facilities damaged such as windows, fencing, doors
- Hydrants turned on, deliberately hit or the nozzle caps removed
- Graffiti on water tanks
- Pollution of a water supply
- Arson fires requiring large volumes of water for fire fighting

#### 4.3.3 Explosion or Bombing

The potential of an explosion occurring at a water treatment plant or in the system has always been a possibility and has in some instances occurred in Indiana. In the past a bombing possibility was only considered during the country's involvement in a war. However, in more recent history and certainly after September 11, 2001, the occurrence of a bombing at a water treatment plant is now considered a possibility.

A few years ago a natural gas explosion in a water treatment plant in northern Indiana destroyed a plant and injured the operator. It can happen. Explosions in a building out in the community can also disrupt the water system. Some of the expected difficulties following an explosion or bombing are:

- Loss of the treatment facility
- Loss of employees
- Contamination of water supply
- Loss of water storage
- Loss of electrical power
- Disruption of the distribution system
- Chemical supplies cut off or restricted
- Loss of chlorine gas or other chemicals to atmosphere

#### 4.3.4 Chemical Spill

Two types of chemical spills can occur; one in the community that affects the raw water supply and secondly a spill in the water treatment plant of a chemical used to treat the water. Chemical spills into the water supply can be serious enough to render the supply unusable for a few hours or days or for many months. These spills occurring out in the community can come from tanker trucks, rail cars, farm containers, drums or barrels or storage tanks at local industries. Chemical spills into some wells in Indiana have ruined the well, making it unfit for public use again without well remediation or other special treatment.

Chemical spills in the plant can cause damage to equipment and floors, can enter the partially treated water or contaminate finished water clear wells. A spill such as chlorine can be hazardous to the employees working at the plant and the surrounding neighborhood.

#### 4.3.5 Power Outage

Most water systems depend upon an outside source of power for the day-to-day operation of the water treatment process and pumping the end product into the distribution system. Although many plants have standby generation for use during power outages, these units are not ordinarily placed on load continuously for long periods of time. In other words, normal operation at a water system depends upon a reliable supply of energy from the outside.

Power outages can disrupt the water plant operation in many ways.

- Reduced pumping ability of raw and finished water
- Reduced treatment capability
- Reduced ability to meet fire demands



#### 4.3.6 Sabotage

The deliberate damage and destruction of a water system's components can occur and has been experienced by water systems across the country. Sabotage often is a result of acts performed by a disgruntled employee or former employee or a citizen who, as a consumer, has felt misused by the water utility; quite often when shut off for nonpayment. Threats from these persons should be taken seriously. Sabotage can include:

- Adding a chemical to raw or finished water
- Disruption of treatment processes
- Turn on of a large quantity of fire hydrants
- Damage to water department equipment including trucks and equipment at a construction site
- Draining of elevated tanks at the tank site
- Disruption of electric or telephone service to the plant or tanks

#### 4.3.7 Terrorism

Before September 11, 2001 a water department did not concern itself as much with terrorism as we do now. Riot, sabotage, and vandalism were considered possible and planning was necessary to prepare for such occurrences. Now the water system operator must add terrorism. The effects of terrorism can and will be similar to those outlined in other sections under Riot, Sabotage, and Vandalism.

Probably the one major difference is the fact many acts of terrorism are a result of a suicide mission therefore will be more direct to the water system and could be more damaging. Acts of arson, contamination, and bombing all are possible due to terrorism. It has been proven that terrorists have planned attacks on public water systems. The threat is serious, the outcome devastating and the defense difficult.

#### 4.3.8 Riot

Although riots have been more prevalent in large metropolitan areas, such a disturbance could occur in a smaller community especially if there is a large gathering of people for some special occasion. A small lake community in Ohio experienced a riot during the hot summer one year when there was a great influx of visitors to the small resort community. Riots can cause the following damage to a water system:

- An orchestrated large demand of water
- Number of fire hydrants damaged and turned on
- Blocked entrance to facilities
- Climbing on water tanks
- Damage to buildings and property
- Bomb threats
- Contamination threats
- Debris thrown into intakes

#### 4.3.9 Chemical Shortages

It is not beyond possibility that a water treatment plant could be affected by a shortage of chemicals. Such a shortage could shut down a plant due to the lack of ability to treat the water, especially a surface water supply. Any number of natural disasters such as floods, tornados and earthquakes could slow or stop delivery of chemicals to an area. A few years ago, due to an energy shortage, chemicals were in short supply from the manufacturers. A trucker's strike has also been known to curtail delivery of needed water treatment chemicals. In a similar situation, a shortage of diesel fuel can cause delivery problems.

#### 4.3.10 Backflow into system

We have all read about water systems that have been contaminated by a user due to backflow; chemicals pumped into the municipal system by way of a feeder or a pumper hooked to a hydrant. Backflow can also enter a distribution system during a reduced or negative pressure situation. As a result of backflow, a small area can be disrupted or in some cases, a large population can be affected. Backflow can include bacteria contamination as well as dangerous chemical additions.

#### 4.3.11 Loss of the operator

In very small water systems, there is only one treatment plant operator to handle the entire water system; treatment and distribution. No one else in the community really understands the treatment plant operation.

There have been cases in these small systems when the operator suddenly dies or is incapacitated and the water system immediately has no operator. This situation can be a real emergency for the community. The water supply can be disrupted or at a minimum, water quality is reduced.

#### 4.4 General Planning for Emergency Preparedness

The two types of emergencies that can affect a water system have been listed; natural and human induced. We have also explained some of the ways those emergencies or disasters can affect a water system. Now we will list a general approach to the planning for emergencies. These suggestions are general in nature and necessary for most emergencies and disasters. More specific and detailed suggestions for development of a plan will follow listing each specific emergency or disaster.

Some suggested items to be included in an emergency/contingency plan are listed below. This is not a complete list and of course cannot be all-inclusive for each individual water system, which must adapt a customized plan. At minimum, a contingency or emergency response plan should include:

- Telephone numbers of all persons critical to an emergency response; water department, fire, police.
- Telephone numbers of Federal, State and local agencies that should be notified in an emergency
- Telephone numbers of all suppliers who provide water system chemicals, tools, materials and distribution supplies
- Telephone numbers of other water departments in the area that could provide assistance and materials
- List of radio call letters and unit numbers of all local departments that would respond to an emergency
- Material Safety Data Sheets (MSDS) for each chemical handled at the water treatment plant
- Telephone numbers of all public utility suppliers to the water system including their emergency response numbers: telephone, electric, natural gas, fuel, propane, internet service, radio system

The plan should include these actions:

- Set up activation guidelines outlining the type of emergency, the response to be taken, and who activates the response
- Name a person who will handle news media response and a back-up person
- Identify an alternative source of water supply: alternate connections and temporary pipeline suppliers
- Install and maintain a stand-by generator
- Update the emergency plan quarterly and update the plan monthly for phone number and name changes
- List the larger water users in the community with phone numbers and contact persons
- List of water users who have critical health needs with phone numbers and a list of alternate sources of water supply for those users
- Keep up-to-date maps of the water distribution system and treatment plant including valve locations
- Keep operations and maintenance manuals updated and in several locations
- Determine the list of locations where copies of the contingency plan are to be kept

- Establish a disaster center and place a copy of the plan there, which may be off site from the water treatment plant
- Prepare draft emergency purchase resolution or ordinance
- Prepare drafts of a boil water notice, water conservation plan, and “stop use” water notice
- Prepare a written explanation of how to obtain alternative sources of drinking water
- Prepare a draft depressurization notice
- Prepare a draft state of emergency declaration for the community
- Prepare a media notification plan including a list of media contacts and phone numbers
- Make sure all water department employees review and understand the contingency plan

#### 4.5 Detailed planning and a course of action for specific emergencies

Specific suggestions to be included in an emergency response plan follows. These suggestions relate to the emergencies and disasters listed in sections 4.2 (Natural) and 4.3 (Human Induced) and are in addition to the general suggestions made above.

##### 4.5.1 Natural Disasters

###### 4.5.1.1 Floods

- Enlist stand-by generators
- Closely monitor raw water quality especially turbidity, bacteria levels.
- Locate a supply of sandbags and sand
- List of pumps available to temporarily replace pumps lost due to flooding
- Monitor all river crossings for heavy loss of water
- Locate and list names of boat and outboard motor suppliers
- Know alternative sources of water supply, auxiliary supplies and inter connections with other water systems
- Keep emergency numbers of laboratories that can run bacteria tests

#### 4.5.1.2 Earthquake

- Review with the system's insurance carrier the need and coverage for earthquake damage
- Maintain adequate supply of repair clamps for distribution piping
- Good valve location records
- Inspect for damage all tanks, reservoirs, dams, floodwalls and buildings after quake
- Utilize stand-by generators

#### 4.5.1.3 Tornado

- Utilize stand-by generators
- Inspect for damage following storm
- Check intake for surface water supply clogged with debris
- Monitor distribution water losses, services and hydrants
- Keep an adequate supply of hydrant and service repair materials

#### 4.5.1.4 Blizzard

- Make prior arrangements for adequate snow and ice removal to plant access
- Provisions at water plant for employees to stay over: food, clothing, bedding and cots

#### 4.5.1.5 Ice Storm

- Run stand-by generators
- Keeps plant access open: salt roadway
- Provisions for employees to stay over: food, clothing, bedding and cots

#### 4.5.1.6 Deep Freeze (extreme cold weather)

- Maintain an adequate stock of repair clamps, hydrant repair parts, service piping and NSF approved garden hose for temporary lines
- Prepare pumps, trucks, backhoes and electric welder for the winter
- Stock adequate winter turnout gear for crews: boots, gloves, heavy clothing, hard hat liners
- Check vehicles for antifreeze
- Public notice to media reminding customers to protect piping
- Insulate shallow meter pits
- Change water levels in storage tanks frequently
- Drain all equipment not in use
- Make sure all maps and valve location cards are up-to-date
- Review safety procedures used when thawing water lines

#### 4.5.1.7 Drought

- Water quality will be diminished while testing of a surface water supply will have to be performed more often.
- Impurities will be more concentrated.
- Water conservation efforts will be required
- Sprinkling bans
- Car washing bans
- Watering lawns will be reduced or stopped
- Call on large users to reduce usage or recirculate water
- Patrol watershed to reduce any source of pollution during low flow periods
- Watch well levels closely to protect pumps from low water levels

#### 4.5.1.8 Major Water Main Break

- Always stock repair clamps for all size mains in your system
- Keep emergency response equipment in ready condition
- Institute boil water directive if pressure is lost
- Provide adequate traffic control around break area
- Keep all valve location cards up-to-date

- Keep all water distribution maps current
- Keep news media informed of outages, probable repair time required, and area to be shut off
- Keep your water office informed, they get all the calls

## 4.5.2 Human Induced Disasters

### 4.5.2.1 Strike

- Utilize police department to gain entry to treatment facilities
- Outside operating assistance may have to be contracted if the supervisory staff is not large enough to maintain water service
- Just prior to the strike, you may want to position a supervisory person at the water facility
- Follow your strike plan

### 4.5.2.2 Vandalism

- Involve the police department from the beginning
- Work to prevent further acts of vandalism
- Place temporary guards or lookouts at key facility structures
- Cooperate with law enforcement officials by providing the names of disgruntled employees, terminated employees, recent irate customers and the most recent shut-off list
- Publicize the acts of vandalism and ask citizens to watch for unusual acts in the water distribution system
- Look also at the action suggested under Riots and Sabotage

### 4.5.2.3 Explosion

- First contact will be the Fire Department
- Evacuate treatment facility and surrounding area
- Contact gas company if served by natural gas
- If the explosion renders the facility inoperable, begin conservation action and ask all large consumers to reduce water use



- After the fire is suppressed and the source of explosion is removed such as natural gas shut off, assess damage and take action as needed
- It may be necessary to turn to an alternative supply
- Water quality may be reduced but the facility can maintain service
- A boil water advisory may be in order along with a recommendation to use bottled water
- Consider the use of fire pumpers to supply pressure and temporary chlorination from portable feed pumps
- The National Guard may have to bring in water buffalo storage tankers

#### 4.5.2.4 Chemical Spill

- Immediately refer to the Material Safety Data Sheets (MSDS) for assistance on how to handle the chemical spilled
- Isolate spill where possible
- Call in the area Haz-Mat team
- Contact the local Fire Department
- If chemicals are spilled into the raw water supply, determine the length of time for the chemical to pass by the intake
- Look at an alternate source of water for the interim
- If spill is from a source outside the facility, determine the chemical spilled, the volume lost, potential effect on the water supply and clean-up measures required
- Know the utility's watershed and the flow in the stream which can help determine the time of travel before a spill will reach the treatment plant
- Notify IDEM for assistance in testing for the concentration of the chemical spilled and possible solutions to the emergency
- Immediately notify water systems downstream of your knowledge of a spill having occurred

#### 4.5.2.5 Power Outage

- Utilize stand-by power
- Water conservation efforts may have to be initiated depending upon the duration of outage
- Initiate curtailment orders
- Notify news media of outage
- Call on users to reduce demand on the system
- In cases when there is no stand-by power, the fire department pumper can be used to pump into the distribution system
- Reduce non-essential use of electricity at the plant
- Keep informed as to the electric company's progress to restore service
- Ask all large users to cut usage or shut down if outage is projected to be long term

#### 4.5.2.6 Sabotage

Many of the approaches taken to handle acts of sabotage are the same actions used for acts of Vandalism, Riot and Terrorism. Refer to those sections for assistance.

Again the Police Department should be notified early on. Provide the names of those who you think may be upset with the water department. Acts of sabotage can come from within an organization as well as from the outside.

All efforts should be made to prevent a second occurrence of sabotage. If the culprit is not determined, work with Police Department officials to attempt to determine the saboteur's next move.

#### 4.5.2.7 Terrorism

Since September 11, 2001 there has been a new concern at water treatment plants – terrorism. It seems now more than ever to be a real threat; one to reckon with. The first action a municipality can take is in the area of hard security, that is fencing, gates, locks, ID cards, television monitoring; these kinds of precautions.

In addition, a water system should be forever vigilant. Look for strange occurrences. Watch for unusual requests for information. Be aware of service requests for turn on of water to an old abandoned building, such as a warehouse with a large service line connected to a major water main in the system.

Have meter readers, water distribution crews, service personnel and billing clerks to be on constant lookout for strange and unusual requests dealing with the water system.

Alert the police and fire departments and county sheriffs department to be on the lookout for people connecting to fire hydrants and using tankers and pumps around hydrants and water tanks. Constant vigilance is the best defense.

Another line of defense is to carry an adequate chlorine residual in the distribution system. Loss of chlorine residual will serve as the best indicator that something foreign may be in the water.

Review the process of lending out prints of the distribution system and sharing information about the water supply. Tighten up this process.

Require a sign-in sheet and references for those not know well. If the system has been terrorized, contact the Police Department as soon as possible. They are the experts in dealing with this situation. Also contact IDEM.

Terrorism carried out to other parts of the community can also cause problems for the water system including high water loss, large fire flows, loss of access to valves, damaged pump stations and lines.

#### 4.5.2.8 Riot

During a riot, large volumes of water could be used due to fires, unauthorized use of hydrants or an organized large drain on the system. Trucks and equipment should be kept away from the scene if possible. Around the clock monitoring of all facilities should occur and all tanks should be kept full, if possible.

Utilization of police or National Guard may be needed to gain access to remote parts of the water system such as dams, tanks or wells. Do not attempt to gain access alone during a civil disturbance.

#### 4.5.2.9 Chemical Shortage

Make arrangements with other water departments and industries that use similar chemicals to supply operation. Carry adequate inventory to outlast a shortage.

Keep abreast of shipping companies' labor contracts, manufacturer and supplier problems and anticipate shortages. Develop a plan to operate with lower dosages of chemicals if need be.

Disinfection is of the utmost importance. Adequate chlorine will need to be on hand. Softening may not be needed. Choose the raw water easiest to treat if alternate supplies are available.

Call on IDEM and USEPA to assist in obtaining chemicals if an emergency exists.

#### 4.5.2.10 Backflow into system

As mentioned in other sections, chlorine residual in the distribution system is the best line of defense against contamination due to an accident or deliberately added to the water. Unfortunately, customers will notice the effects of a backflow situation before the water department finds out. Customers will experience color, taste, odor, or a "slippery" feeling in the water and call. All such calls should be taken seriously. A service person should respond to the call, sample the water, look for possible backflow situations in the area and have the laboratory run tests as soon as possible. In the meantime, suggest the use of bottled water for drinking and food preparation until the investigation is complete. Once it has been determined that a backflow has occurred, the area affected needs to be flushed, users notified not to use the water and the source of the contamination needs to be located.

The best defense for backflow is a proactive backflow prevention program requiring backflow preventers in areas where backflow can occur.

#### 4.5.2.11 Loss of Operator

Most nontransient noncommunity are operated by one person. If that person becomes ill, incapacitated or dies, the system needs to have in place a plan for immediate replacement of the operator for an interim period.

The water system should, as a part of its contingency plan, have a list of area plant operators who could assist the system if the single operator were out of the picture. The plan should also list contract operation firms who could bring in an operator on short notice. IDEM should also be contacted and may provide some assistance.

### 4.6 Summary

We have now looked at the types of emergencies and disasters that can occur. We have listed the effect of such emergencies on a water system and we have listed both general planning needs and more detailed and specific plans the water system must include in an emergency/contingency plan. Now it is up to the operator. The operator must fill in the blanks. Complete the plan to fit the system and keep it updated so that it is workable.

Review the plan regularly and go over the plan with employees, fire, police and emergency management agencies. A good, workable, up-to-date plan is the best line of defense for any kind of emergency or disaster that the water system will face. It is up to the utility to be prepared.

Contact IDEM in all cases of emergency at (800) 451-6027.

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